FSSAT Results for Modeling of CARB's Zero-Emission Appliance Standards into 2023 IEPR

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Statewide and Local Emission Standards/Rules/Measures

- Statewide:
  - CARB's 2030 zero-emission space and water heating appliance standard from the 2022 State SIP Strategy[1].
    - Rulemaking process started in 2023 (first workshop on May 10th).
    - Expected regulatory board hearing date of 2025.
- Local:
  - BAAQMD[2] Regulation 9, Rules 4 and 6 for space and water heating appliances:
    - Adopted by the air district in March 2023.
  - SCAQMD[3] low- and zero-emission control measures for multiple end uses:
    - Rulemaking process for residential measures starting date – Anticipated early 2024.

[1]2022 State Strategy for the State Implementation Plan, adopted on September 22, 2022

[2]Bay Area Air Quality Management District - Final Staff Report on Proposed Amendments to Regulation 9, Rule 4 and Rule 6

[3]South Coast Air Quality Management District - 2022 Air Quality Management Plan and Public Consultation Meeting Presentation on Amended Rule 1111

Fuel Substitution Scenario Analysis Tool

- FSSAT used for:
  - AB 3232 California Building Decarbonization Assessment
  - Demand Scenarios project
  - 2022 IEPR Demand Forecast Update
- FSSAT is a “what if” policy analysis tool examining the cost, energy, and greenhouse gas impacts of different fuel substitution scenarios given different levels of additional achievable energy efficiency (AAEE) and fuel substitution (AAFS) assumptions.

AAFS Levers for the Modeling of the Zero-Emission (ZE) Appliance Standard in FSSAT

	AAFS Levers	AAFS 3	AAFS 4	AAFS 5	AAFS 6
Programmatic Characterization	**AAEE Gas/Elec Scenario**	Scenario 3	Scenario 2	Scenario 2	Scenario 2
	Programmatic AAFS	Scenario 3	Scenario 4	Scenario 5	Scenario 6
ZE Appliance Technology Characterization (modeled via FSSAT)	**Water Heater and Space Heating**	Yes	Yes	Yes	Yes
	Other FSSAT end uses	No	No	Yes	Yes
	Residential Propane	No	No	Yes	Yes
	AQMDs	BAAQMD	BAAQMD	BAAQMD	BAAQMD & SCAQMD
	Technology Set	Mixed	Mixed	Mixed	***Mixed** *
	Technology Efficiency Weighting	Even	Even	Even	***High*** **
	Ramp Adoption Rate	Linear Ramp (10% reduction in interim Years)	Linear Ramp	Linear Ramp	Linear Ramp

***Revised from "single-best technology"** ****Revised from "NA"**

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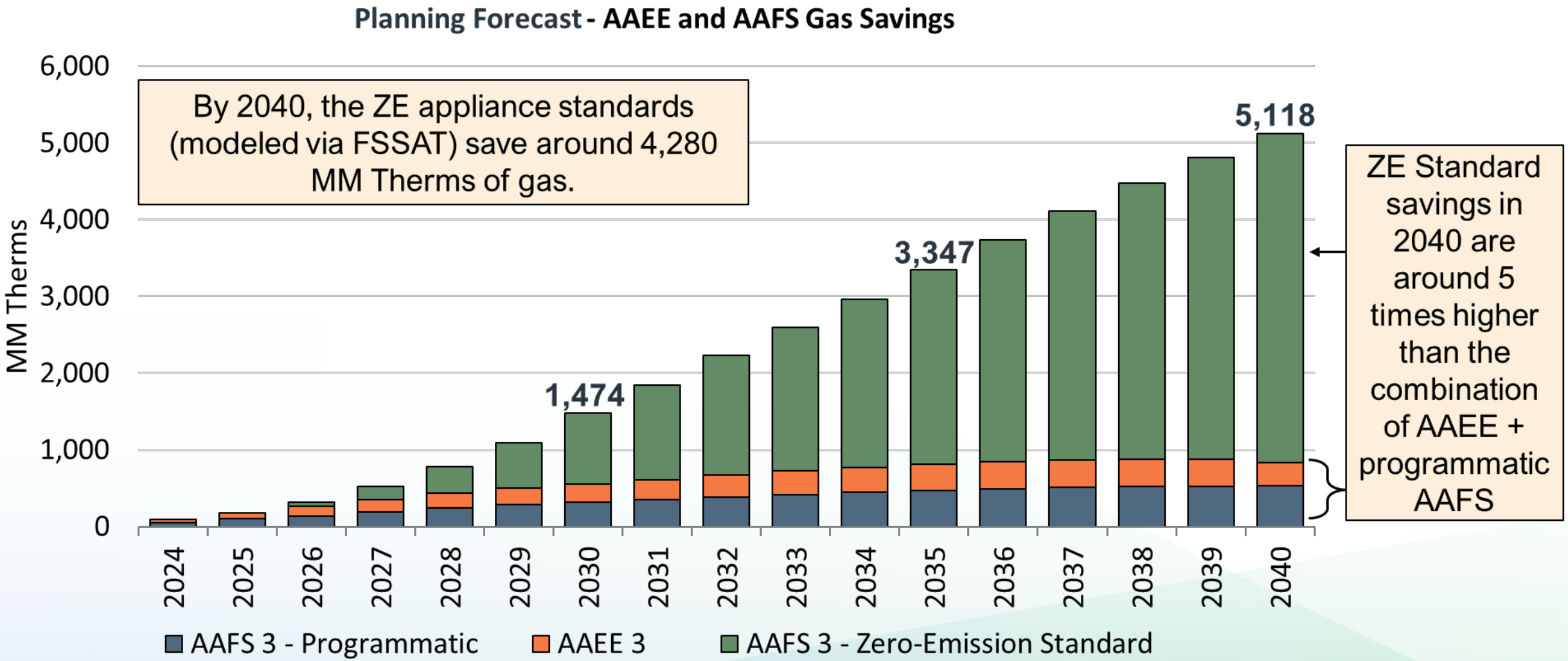
Load Modifier Results

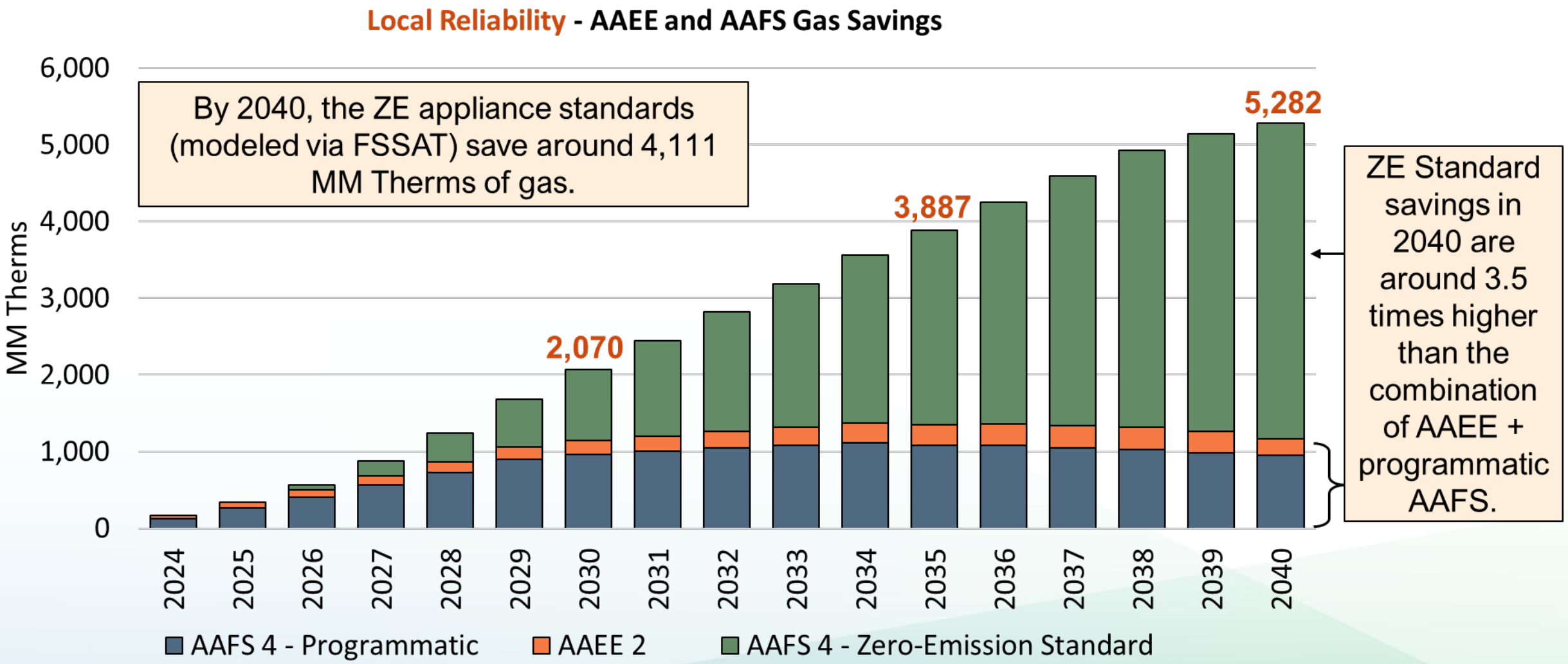
- Results in the following slides will show:
  - Energy impacts of the AAEE and AAFS (programmatic and ZE Standard) load modifiers.
    - Commercial and Residential sectors.
  - Added electric appliances from AAFS scenarios
    - Residential HVAC and Water Heating.
- Results will be split into the following sections:
  1. Gas impacts for Planning Forecast and Local Reliability Scenario.
  2. Electricity impacts for Planning Forecast and Local Reliability Scenario.
  3. 2022 IEPR Update and 2023 IEPR load modifier comparison for Local Reliability Scenario.
  4. Added electric appliance impacts for Planning Forecast and Local Reliability Scenario.

Gas Impacts – Planning Forecast



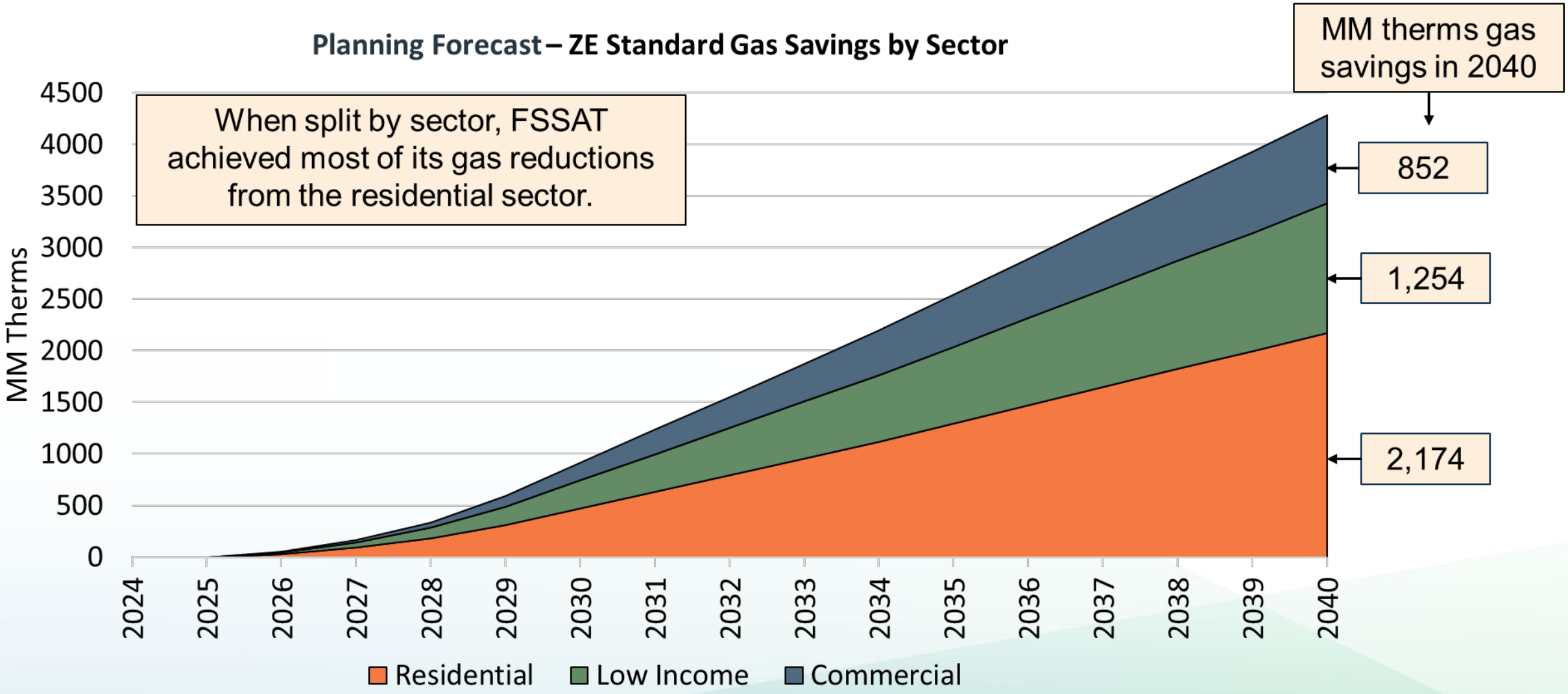
Source: Energy Commission Staff Analysis

Gas Impacts – Local Reliability



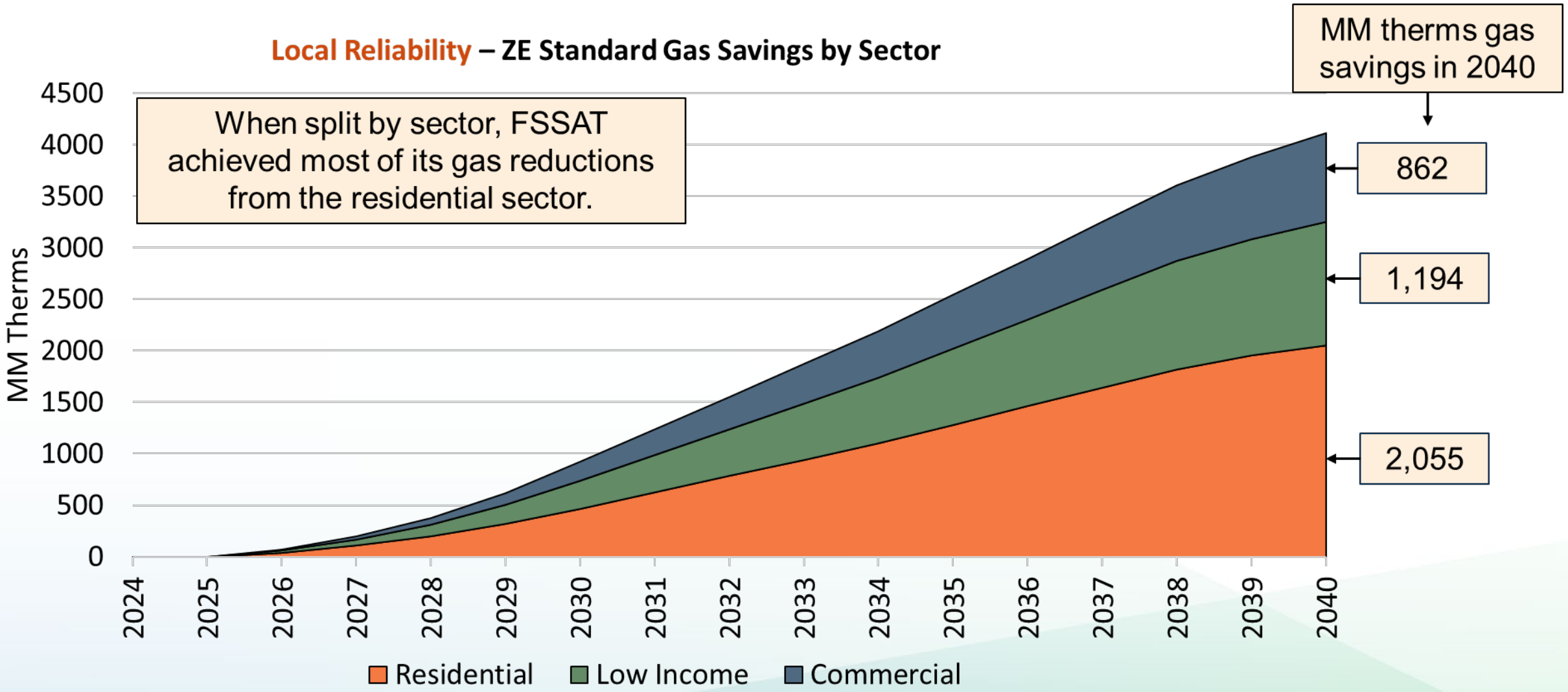
Source: Energy Commission Staff Analysis

Sector Based Gas Impacts – Planning Forecast



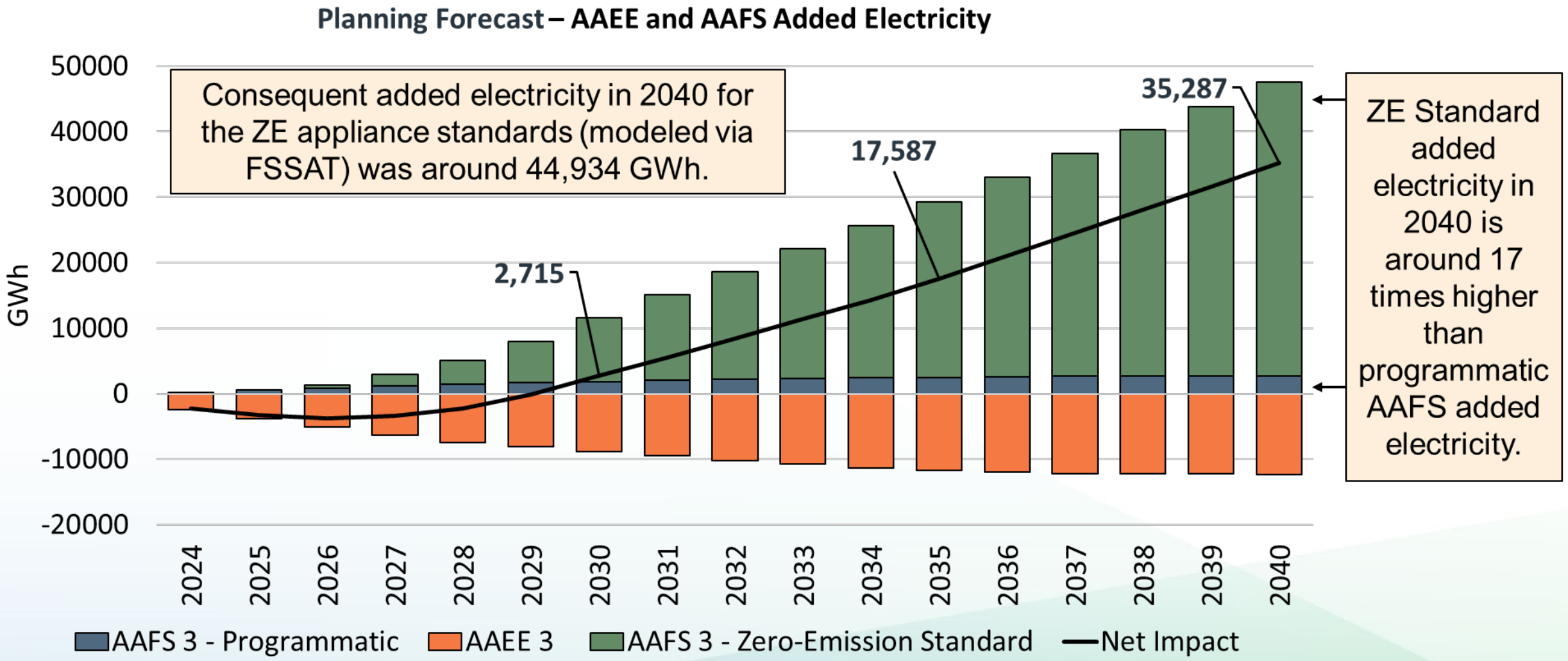
Source: Energy Commission Staff Analysis

Sector Based Gas Impacts – Local Reliability



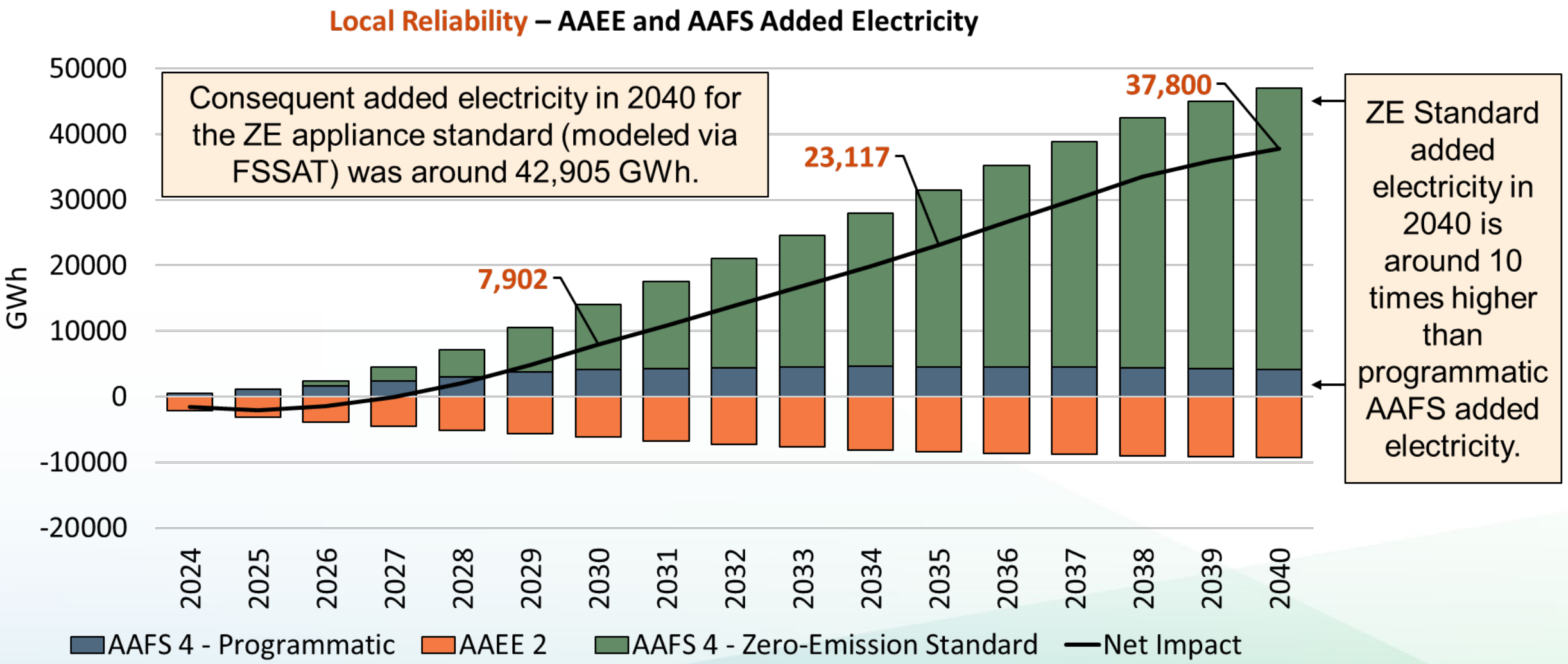
Source: Energy Commission Staff Analysis

Electricity Impacts – Planning Forecast



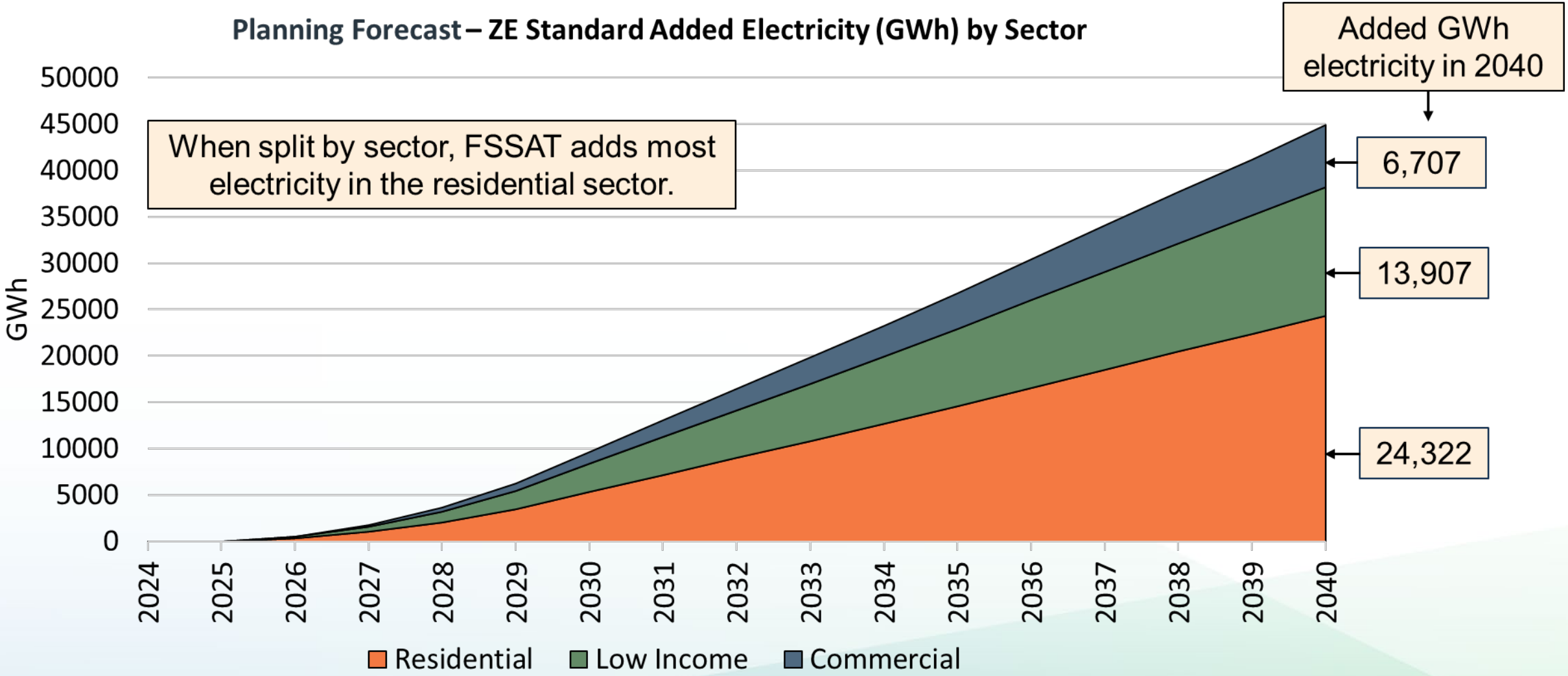
Source: Energy Commission Staff Analysis

Electricity Impacts – Local Reliability



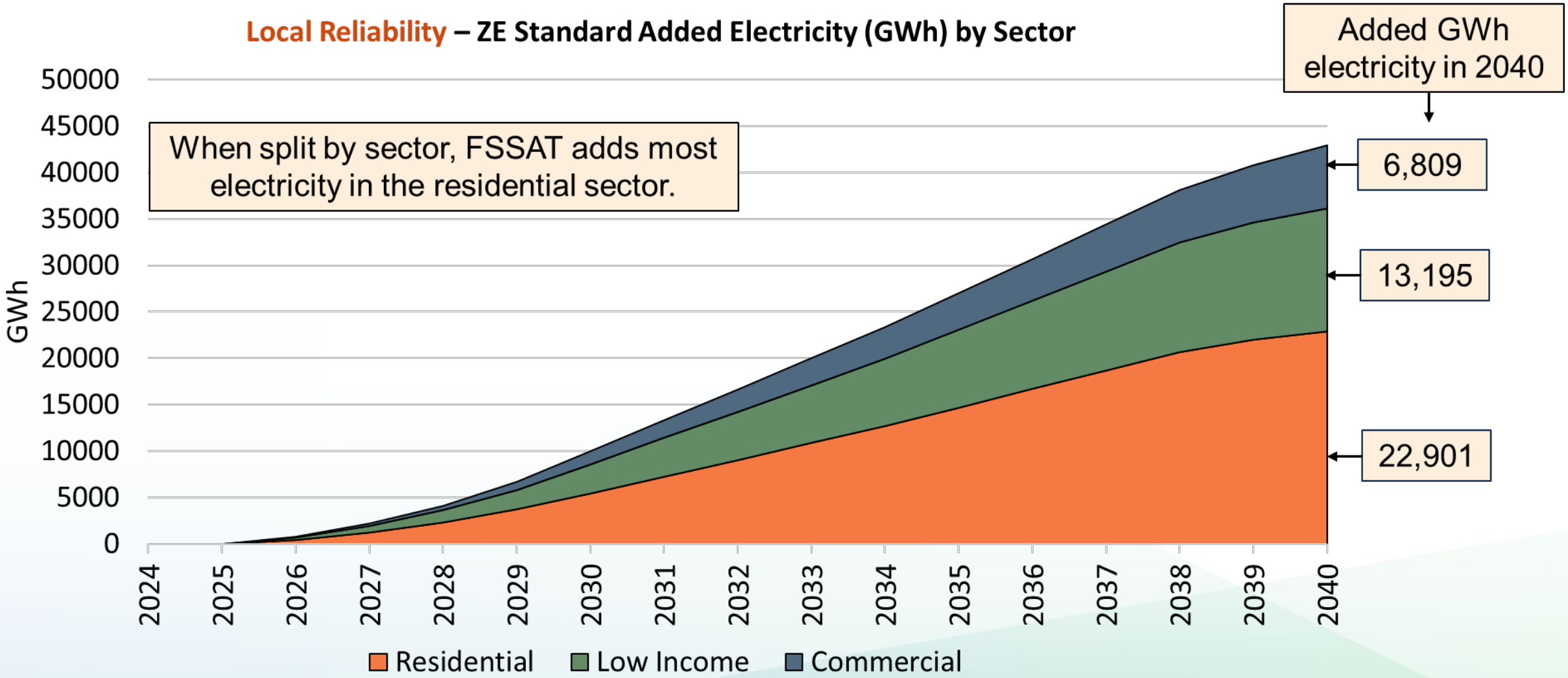
Source: Energy Commission Staff Analysis

Sector Based Electricity Impacts – Planning Forecast



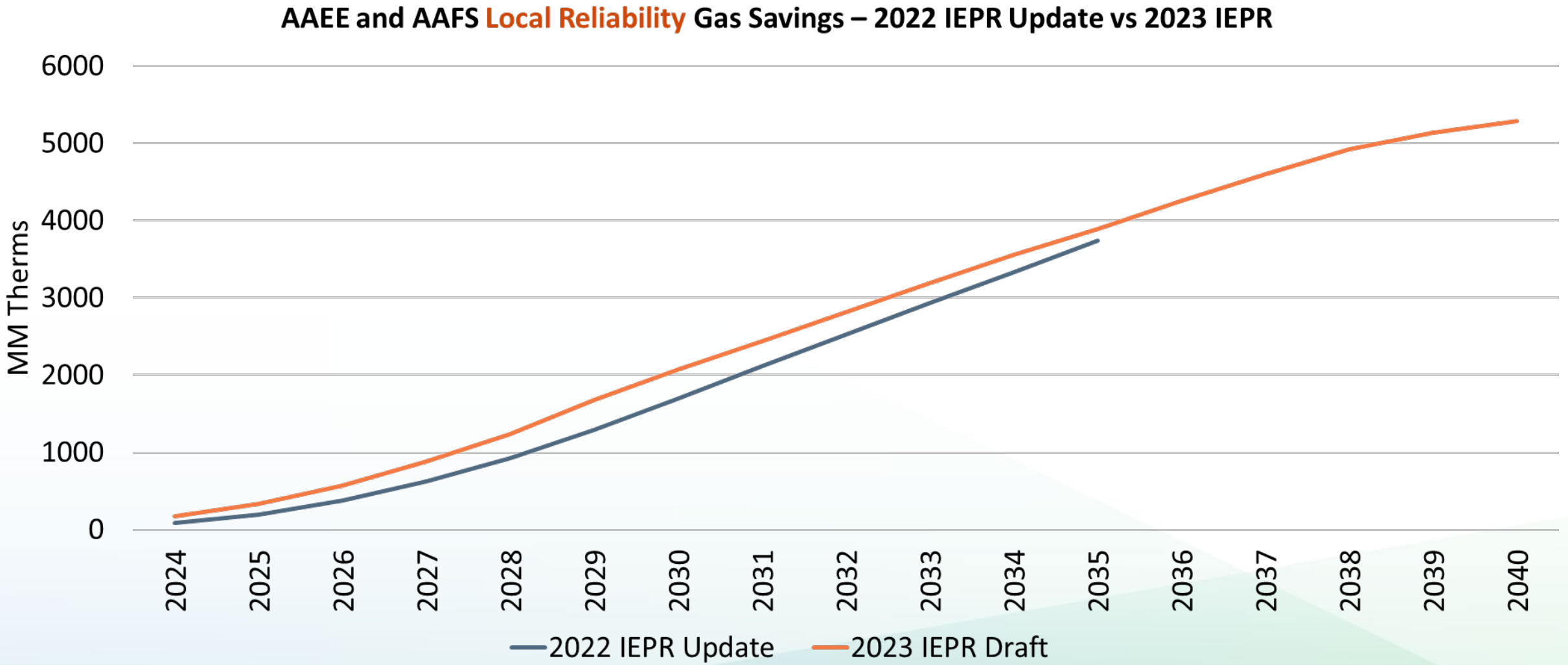
Source: Energy Commission Staff Analysis

Sector Based Electricity Impacts – Local Reliability



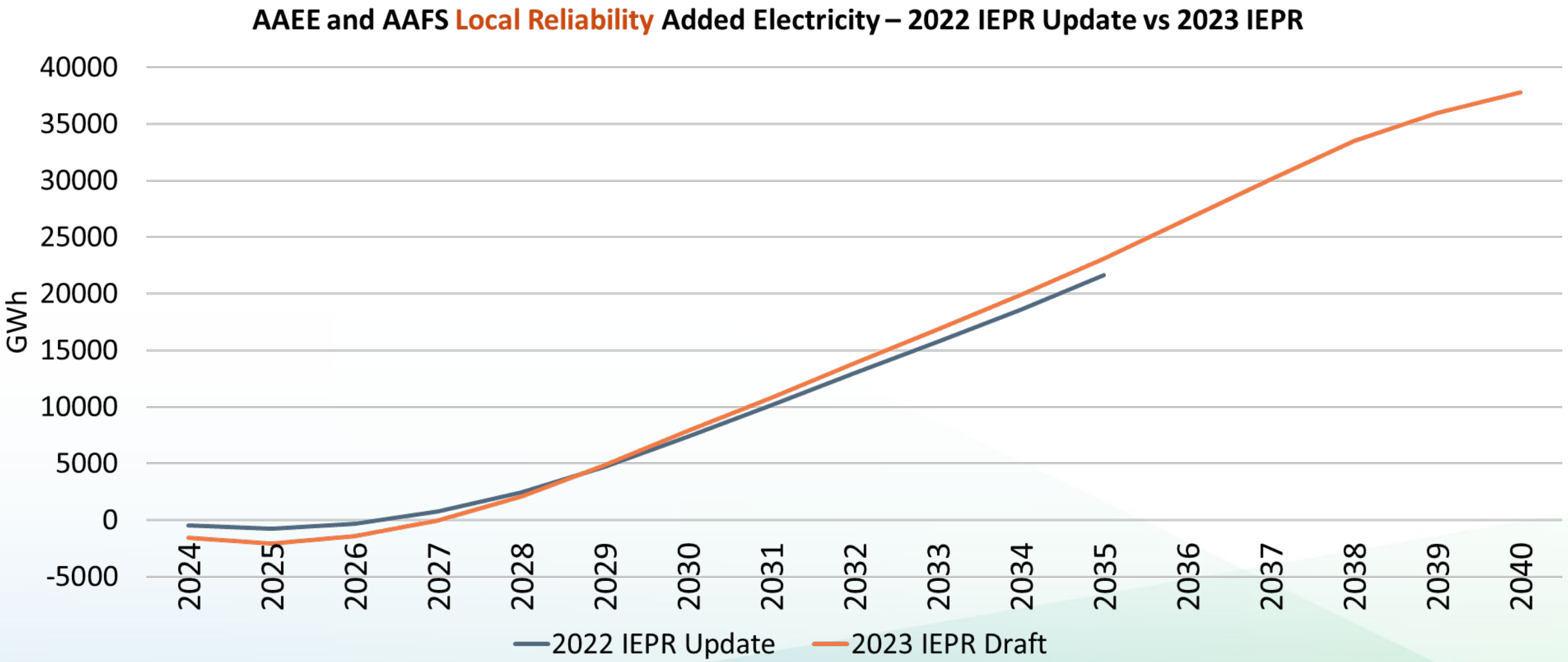
Source: Energy Commission Staff Analysis

Local Reliability Gas Impacts - 2022 IEPR Update vs 2023 IEPR



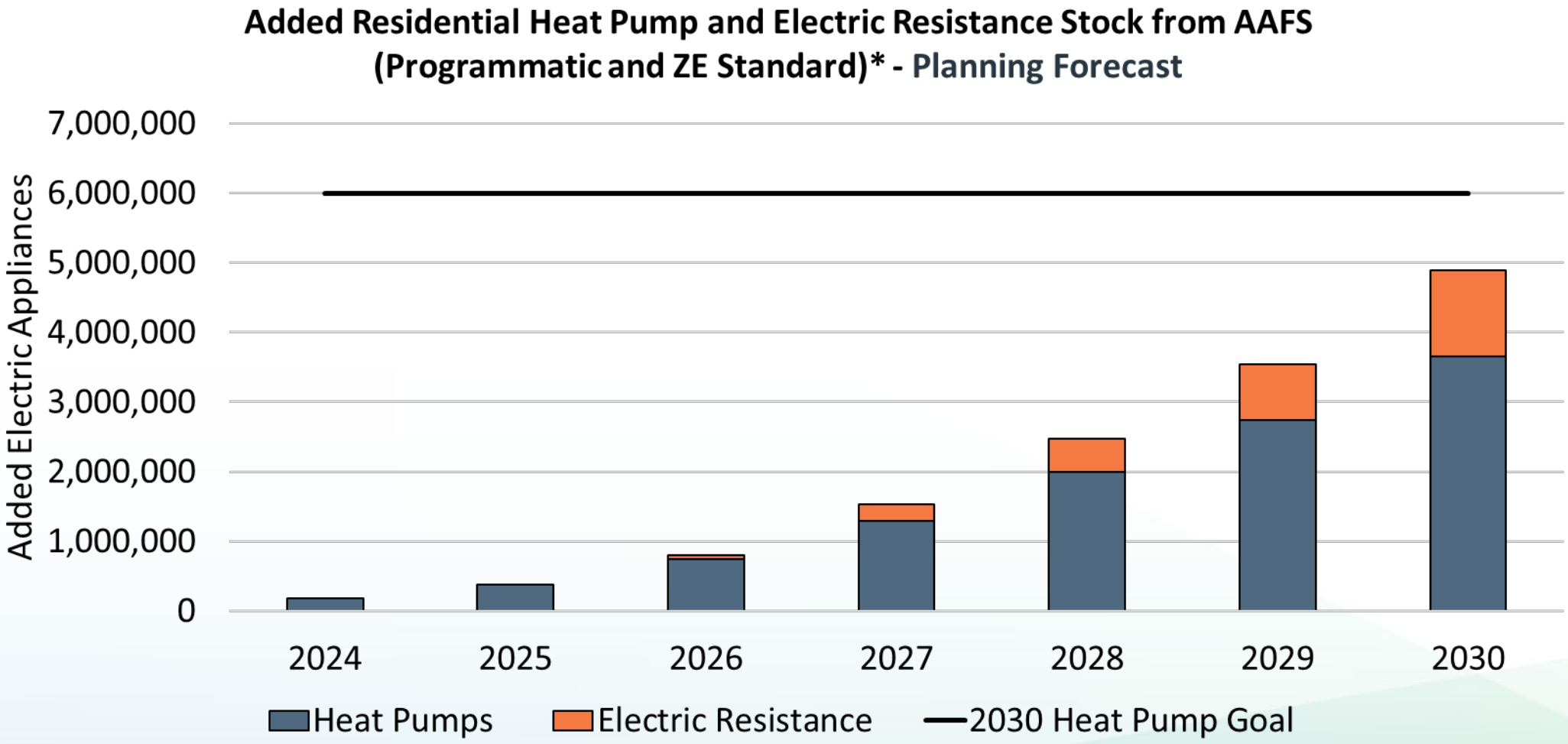
Source: Energy Commission Staff Analysis

Local Reliability Electricity Impacts - 2022 IEPR Update vs 2023 IEPR



Source: Energy Commission Staff Analysis

Estimated Added Electric Appliances – Planning Forecast

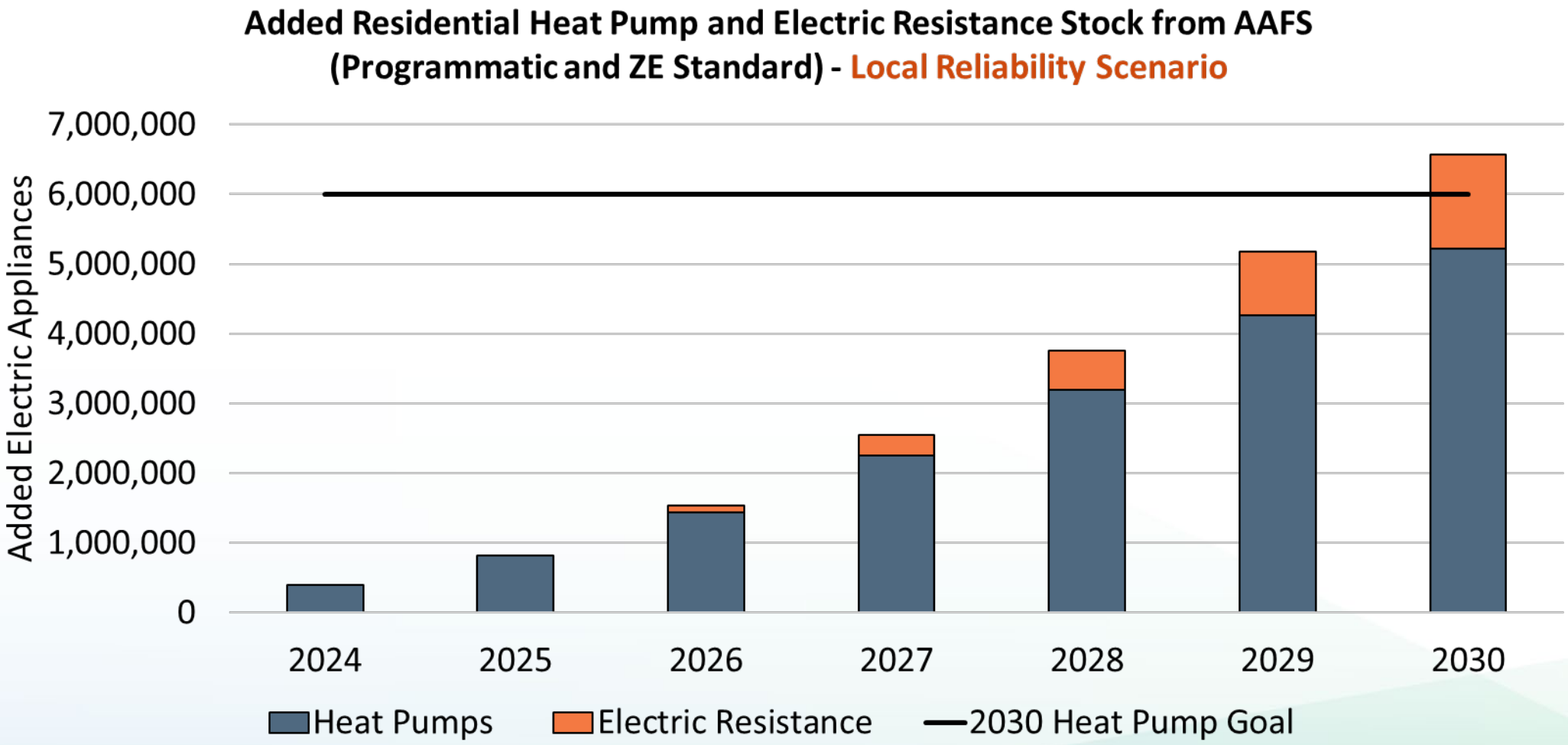


Note: Does not incorporate added heat pumps from the commercial sector and does not incorporate previously installed heat pumps.

These numbers will be revised.

Source: Energy Commission Staff Analysis

Estimated Added Electric Appliances – Local Reliability Scenario



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FSSAT Analysis Changes from 2022 IEPR Update

- Incorporates the impacts from the zero-emission appliance standards for both the planning forecast and local reliability scenario.
- Characterized four scenarios of the zero-emission appliance standards for AAFS Scenarios 3 through 6.
    - Changed the technology efficiency weighting from highly to evenly weighted for the planning forecast and local reliability forecast.
    - Revised adoption rates for commercial new construction.
    - Addition of new SCAQMD and updated BAAQMD proposed measures/rules.
    - AAFS Scenarios 5 and 6 considers propane and other end uses.
- Updated Commercial and Residential buildings and energy forecast data.

Next Steps

- Update to 2023 baseline Commercial and Residential IEPR energy forecasts in FSSAT.
- Present these draft results, including AAFS scenario 5 and 6, at the November 15th IEPR workshop.
- Update technology characterization in FSSAT for next IEPR cycle.

Thank you

Questions?

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Appendix: State Zero-Emission Appliance Standards Table for CARB

Table 3: Statewide Zero-Emission Appliance Standards from CARB

Implementer	CARB
Regulation/Rule/Measures	Zero-Emission Appliance Standard
Description	Measure stating that, beginning in 2030, 100 percent of new space and water heaters (for either new construction or existing buildings) sold in California would need to meet the zero-emission standard.
Jurisdiction	Statewide
Data Source Links	CARB 2022 State SIP Strategy

Appendix: Local Zero-Emission Appliance Standards and Rules Table for BAAQMD

Table 4: Local Zero-Emission Standards and Rules from BAAQMD

Implementer	BAAQMD
Regulation/Rule/Measures	Regulation 9, Rule 4 and 6 for Building Appliances
Description	Rule 9-4: Zero NOx emission standard starting in 2029 for gas-fired space heaters. Rule 9-6 (small water heaters): Zero NOx emission standard starting in 2027 for gas-fired water heaters below 75,000 BTU/hour. Rule 9-6 (large water heaters): Zero NOx emission standard starting in 2031 for gas-fired water heaters between 75,000 - 2,000,000 BTU/hour.
Jurisdiction	Bay Area air district
Data Source Links	BAAQMD Final Staff Report on Proposed Amendments to Regulation 9, Rule 4 and Rule 6

Appendix: Local Low- and Zero-Emission Control Measures Table for SCAQMD

Table 5: Local Low- and Zero-Emission Control Measures from SCAQMD

Implementer	SCAQMD
Regulation/Rule/Measures	Control Measures R-CMB-01, R-CMB-02, R-CMB-03, R-CMB-04
Description	R-CMB-01: Control measure proposing a rule to require the installation of only zero or low NOx water heaters in the residential sector starting in 2029. R-CMB-02: Control measure proposing a rule to require the installation of only zero or low NOx space heaters in the residential sector starting in 2029. R-CMB-03: Control measure proposing a regulatory and incentive approach to switch residential gas cooking equipment with zero or low NOx emission appliances starting in 2029. R-CMB-04: Control measure proposing a rule to require the installation of only zero or low NOx appliances for other/miscellaneous end uses in the residential sector starting in 2029.
Jurisdiction	South Coast air district
Data Source Links	SCAQMD 2022 Air Quality Management Plan

Appendix: Zero-Emission Appliance Standards Replacement Assumptions

Table 2: FSSAT Zero-Emission Appliance Standards Replacement Assumptions for the 2023 IEPR

Territory	Building Type	AAFS Scenario	2020-25	2026	2027	2028	2029	2030-40
All Air Districts	Commercial New Construction	All	0%	0%	0%	0%	100%	**100%**
All Air Districts	Residential New Construction	All	0%	100%	100%	100%	100%	**100%**
All Air Districts besides BAAQMD and SCAQMD	Existing Buildings*	AAFS 4-6 (AAFS 3)	0%	20% (10%)	40% (30%)	60% (50%)	80% (70%)	**100%**
BAAQMD	Existing Buildings HVAC	All	0%	25%	50%	75%	**100%**	100%
BAAQMD	Existing Buildings Water Heating	All	0%	50%	**100%**	100%	100%	100%
SCAQMD	Existing Buildings Residential	AAFS 6	0%	25%	50%	75%	**100%**	100%
All Air Districts	Propane Replacement** Existing Buildings	AAFS 6	0%	20%	40%	60%	80%	**100%**
All Air Districts	Propane Replacement New Construction	AAFS 6	0%	100%	100%	100%	100%	**100%**

*Existing Buildings is only looking at replacing equipment on burnout
**Propane replacement is solely for water heating and HVAC end uses in the Residential sector.